Original Research Article

Effect of Lopping on Lodging, Productivity and Labor Utilization for Rice Cultivation at Transplanting Aman Season

ABSTRACT

To study the effect of lopping on lodging, productivity and labor utilization for rice cultivation an experiment was conducted at Bangladesh Rice Research InstituteBRRI Farm, Gazipur during Ttransplanting Aman season. The experiment was carried out in a randomized complete block design (Factorial) with three replications, in a 3 x 2 factorial scheme. The experimental treatments were: three lopping Viz. i) C(control i.e., no lopping, ii) lopping at 30 DAT and iii) lopping at 45 days after transplanting - DAT); and two cultivars viz. i) (BR-22 and ii) BRRI dhan32). Interaction effect of lopping and variety was not significant (P > 0.05). The tallest plant (123 cm) was found in 'no lopping' treatment followed by lopping at 30 and 45 DAT. A similar trend was observed in lodging (%) and labor requirement for harvesting of rice. Lopping at 45 DAT produced the highest number of filled grain panicle^{-1} (117), grain yield (5.9 t ha^{-1}) and straw yield (6.5 t ha^{-1}) followed by lopping at 30 DAT and no lopping (control). However, there was no significant effect of lopping on labor requirements for threshing of rice. Therefore, effect of lopping on the yield and yield contributing characters of rice showed that lopping had positive effect on yield and decreasing lodging tendency of the studied variety. It was found that lopping at 45 DAT and 30 DAT could increase the rice yield. BR22 and BRRI dhan32 had statistically similar effect on lodging tendency.

Key-words: *Lopping, lodging, labour, and rice.*

1. INTRODUCTION

Rice (*Oryza sativa*) belongs to the family Gramineae. In Asian countries, rice is a staple food for at least 62.8% of total planet inhabitants and it contributes on an average 20% of apparent calorie intake of the world population and 30% of the population [1]. The overall agricultural development in Bangladesh conceals considerable regional differences because of farming practices, techniques, availability of irrigation facilities, attitude of the farmer etc. in different parts of the country. Regional variations in agricultural development show that there is scope to boost up the pace of agricultural development and thereby that of economic development in the country with area specific agricultural development programmes and policies [2]. The poor economy of the country cannot afford to contend with low rate of crop yields in view of heavy pressure of population on agriculture.

Rice straw is the staple feed for the livestock, but this straw is not sufficient for livestock population during kharif season when the entire fields are occupied by wetland rice. Moreover, there is a severe crisis of green fodder during this lean period. The only livestock feed supply is rice straw which are nutritionally poor and also less in quantity because of limited land holding. On the other hand, heavy wind speed and hailstorm is common during October to November the reproductive to ripening phase of most transplantingT. Aman cultivars in Bangladesh.

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Detopping or lopping is one of the suitable management options for reducing plant height. One the other hand it is one of the best options to feed cattle during rainy days. In some deep-water areas of East Pakistan, Badal a traditional deep-water rice variety is grown as a fodder [3]. Cutting long duration rice leaves at the vegetative stage is also practiced in India [4] and is now more frequently done in Thailand [5]. Detopping really has no effect on the production of grains it may become one of the most economical ways of increasing the yield, with the additional advantages of controlling lodging in case of excessive vegetative growth and will provide the farmers with green feeding materials for their work animals, without sacrificing the grain yield.

In general, long duration rice varieties have higher plant height (125 to 140 cm) than short duration varieties [6] and these cultivars has higher tendency to lodge. Suitable management practices are essential to ensure expected yield of these variety. Lopping at proper time can ensure good yield and can be able to reduced labor cost during harvesting. With the view, the objective of the study is to find out the effect of lopping on yield, yield component of rice and labor utilization.

2. MATERIALS AND METHODS

2.1 Experimental ~~a~~Area and Planting Material

This experiment was conducted at the West Byde of the Bangladesh Rice Research Institute (BRRI) ~~f~~Farm, Gazipur during transplanting~~T.~~ Aman season. Two modern rice varieties (BR22 and BRRI dhan32) BRRI developed were used in the experiment. The study location situated on 23.98~~3~~^{o} N and 90.45^{o} E having an altitude of 8 m above mean sea level. Sub-tropical monsoon climate condition prevails in the study area. Seventy percent of the total rainfall is received during July to September, with average annual rainfall of 2148 mm. April is the hottest month, with average minimum and maximum temperatures of 23.6~~°~~C and 33.7^{o}°C, respectively [7].
The soils of the study site were characterized as silt clay loam with moderate drainage.

2.2 Experimental Design and Treatments

The experiment was carried~~laid~~ out in a ~~R~~randomized ~~C~~complete ~~B~~block design ~~(Factorial)~~ with three replications, in a 3 x 2 factorial scheme: three lopping (control i.e., no lopping, lopping at 30 and 45 days after transplanting - DAT) and two cultivars (BR22 and BRRI dhan32). The unit plot size was 4 m x ~~×~~2.5 m ~~and~~. ~~Thirty days old rice seedlings were transplanted with the planting spacing of 20 cm×20 cm. BRRI developed two modern rice varieties, BR22 and BRRI dhan32 were transplanted with three treatments. The treatments were 3 lopping viz. i) Control (no lopping) ii) lopping at 30 days after transplanting (DAT) and iii) lopping at 45 DAT.~~

2.3 Crop Conduction

Thirty days old rice seedlings were transplanted with the planting spacing of 20 cm x 20 cm. BRRI recommended fertilizers such as ~~U~~urea, TSP, MP, ~~G~~gypsum and ~~Z~~zinc were applied at the rate of 127-52-82-60-0 kg ha^{-1}. TSP, MP, ~~G~~gypsum and ~~Z~~zinc were applied at final land preparation. Three

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equal splits of urea were applied at 15, 45 and 55 ~~days after transplanting (~~DAT~~)~~. All other cultural operations like weeding, insect-pest and disease management was done as and when necessary.

2.4 Variables Evaluated and Statistical Analysis

Describe the collected variables and how they were obtained.

Yields and yield components data were collected at maturity of the crop. Time requirement (man-day ha^{-1}) for harvesting and threshing were recorded during the period of operation where, eight hours work for laborers was considered as one man-day. Collected data were analyzed in a statistical tool cropstat and the mean differences were adjusted by LSD method.

3. RESULTS AND DISCUSSION

~~Interaction effect of lopping and variety~~

In this experiment, interaction effect of lopping and variety was not significant. For the factors individually, the plant height, lodging at maturity and laborer for harvesting (Table 1) and filled grain, unfilled grain, grain yield and straw yield (Table 2) were significantly affected by lopping. For the variety, the plant height and laborer for harvesting (Table 1) and filled grain and straw yield (Table 2) were significantly affected ~~So, only main effects were presented and discussed here.~~

~~Effect of lopping~~

For the factor~~The plant height was significantly affected by~~ lopping, ~~(Table 1).~~ ~~T~~the tallest plant height (123.6 cm) was observed in ~~"no lopping"~~control treatment (no lopping) followed by lopping at 30 DAT (117.4 cm) and 45 DAT (104.2 cm). This result is similar to [8] who have found that late detopping reduced plant height than early detopping. A similar trend of was observed in lodging at maturity. Among the treatment no lopping showed the highest (30.5%) lodging at maturity followed by 19.8% lodging at looped at 30 DAT. The lowest 10.3% plant lodged when the plant lopped at 45 DAT. There is a close relationship between labor requirement in harvesting and percent lodging. Labor requirement for harvesting was higher in no lopping plot than lopped plot. The highest 23.5 man-day ha^{-1} labor was required for no lopping treatment whereas 20.3 ~~man-day ha~~$^{-1}$ and 18.5 man-day ha^{-1} labor was applied in treatment lopped at 30 DAT and lopped at 45 DAT respectively. However, no significant difference was observed in labor requirement for threshing of harvested rice, with an overall average of 11.43 man-day ha^{-1}.

Table 1. Effect of lopping and variety on plant height, lodging at maturity and laborer ~~requirements~~ for harvesting and threshing during transplanting~~T.~~ Aman, 2001 at BRRI ~~f~~Farm, Gazipur

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Treatments	Plant height (cm)	Lodging at maturity (%)	Laborer for harvesting (man-day ha^{-1})	Laborer for threshing (man-day ha^{-1})
Lopping				

No lopping	123.6a	30.5a	23.5a	12.4
Loppeingd at 30 DAT	117.9b	19.8b	20.3b	11.5
Loppinged at 45 DAT	104.2c	10.3c	18.5c	10.4
LSD (0.05)	1.5	0.69	0.28	ns
Variety				
BR22	117.7a	24.7	21.3a	11.7
BRRI dhan32	112.8b	25.7	20.3b	11.2
LSD (0.05)	3.9	ns	0.72	ns

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Effect of looping on yield and yield contributing parameters were analyzed and presented on Table 2. Result showed that the panicle length, effective tiller hill^{-1} and non bearing tiller per hill were not significantly influenced by lopping but the grain per panicle, unfilled grain per panicle, grain and straw yield were significantly affected by lopping action. It was found that lopping at 45 DAT produced the highest number of filled grain panicle^{-1} followed by lopping at 30 DAT and control. A reverse trend was observed in unfilled grain per panicle. Lopping at 45 DAT produced the highest grain yield followed by no lopping and lopping at 30 DAT. There was no significant difference between lopping at 30 DAT and no lopping. The highest straw yield was observed in lopping at 45 DAT followed by lopping at 30 DAT and no lopping treatment. This result is not identical to [9] who has observed that panicle length decreased due to detopping.

Table 2. Effect of lopping and variety on yield and yield components during transplanting T.Aman, 2001 at BRRI, Gazipur

Treatments	Panicle length (cm)	Effective tiller hill^{-1}	Non bearing tiller hill^{-1}	Filled grain panicle^{-1}	Unfilled grain panicle^{-1}	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})
Lopping							
No lopping	24.3	12.0	3.3	95c	51a	5.6b	6.2b
Lopping at 30 DAT	25.7	11.0	3.0	104b	43b	5.4b	6.5ab
Lopping at 45 DAT	26.6	11.0	2.3	117a	40b	5.9a	6.9a
LSD (0.05)	ns	ns	ns	3.5	4.9	0.22	0.45
Variety							
BR22	25.3	11.0	2.9	103.6b	43.7	5.7	6.7a
BRRI dhan32	25.8	11.0	2.8	107.7a	45.0	5.6	6.3b
LSD (0.05)	ns	ns	ns	2.8	ns	ns	0.37

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Effect of Variety

Plant height of BR22 (117.7 cm) was significantly higher than BRRI dhan32 (112.8 cm) (Table 1) but intensity of lodging had no significant effect (Table 3). Both the varieties have similar lodging at maturity. But BR22 required more labor (21.3 man-day ha^{-1}) for harvesting than BRRI dhan32 (20.3 man-day ha^{-1}). This is because of higher plant height of BR11. BRRI dhan32 produced higher number of filled grain $panicle^{-1}$ than BR22. Similar grain yield BR22 produced higher straw yield (Table 2). The labor requirement for threshing was not significantly influenced by variety.

Table 3: Effect of variety on plant height, lodging and labor requirements for harvesting and threshing during T.Aman, 2001 at BRRI farm, Gazipur.

Variety	Plant height (cm)	Lodging at maturity (%)	Laborer for harvesting (man-day ha^{-1})	Laborer for threshing (man-day ha^{-1})
BR 22	117.7a	24.7	21.3a	11.7
BRRI dhan32	112.8b	25.7	20.3b	11.2
lsd (0.05)	3.9	ns	0.72	ns

Ns=not significant, different letters in the same column differs significantly.

Table 4 showed effect of varieties on yield and yield contributing parameters. Panicle length, effective tiller $hill^{-1}$, non-effective tiller $hill^{-1}$, unfilled grain $panicle^{-1}$ and grain yield were not significantly affected by variety. BRRI dhan 32 produced higher number of filled grain $panicle^{-1}$ than BR22. Similar grain yield BR22 produced higher straw yield (Table 4).

Table 4 Effect of variety on yield components, yields and others parameters

Variety	Panicle length (cm)	Effective tiller $hill^{-1}$	Non-effective tiller $hill^{-1}$	Filled grain $panicle^{-1}$	Unfilled grain $panicle^{-1}$	Grain yield (tha^{-1})	Straw yield (tha^{-1})
BR 22	25.3	11.0	2.9	103.6b	43.7	5.7	6.7a
BRRI dhan32	25.8	11.0	2.8	107.7a	45.0	5.6	6.3b
Lsd (0.05)	ns	ns	ns	2.8	ns	ns	0.37

ns=not significant, different letters in the same column differs significantly

4. CONCLUSION

Effect of lopping and variety on the yield and yield contributing characters of rice showed that The lopping had positive effect on yield and decreasing lodging tendency of the studied variety. It was found that lopping at 30 and 45 DAT and 30 DAT could increase the rice yield. BR22 and BRRI dhan32 had statistically similar effect on lodging tendency. Lopping has a great advantage on reduction of labor requirement in harvesting as well as it saves cost of production. But optimum time of lopping may varied on cultivar and management practices.

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